19. Prove that if the arrivals are completely Random then probability distribution of Number of arrivals on a fixed time intervals in a poisson distribution.

20. A computer contains 10,000 Resistors, When any Resistors fails, it is Replaced. The cost of Replacing a Resistor individually is Rs.1 only. If all the Resistors are replaced at the same time, the cost per Resistor would see Reduced to 35 paise % of surviving Resistor say S(t) at the end of month (t) and the probability of failure P(t) during the month t are as follows:

t	0	1	2	3	4	5	6
s(t)	100	97	90	70	30	15	6
p(t)	-	0.03	0.07	0.20	0.40	0.15	0.15

What is the optimal replacement plan.

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APRIL/MAY 2023

DEMA34C — OPERATIONS RESEARCH

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define pay off.

2. Define EMV.

3. Define dummy activity.

4. Define total float.

5. Define purchase cost.

6. What are the types of decoupling Inventory?

7. What do you understand by queue discipline?

8. Define priority service.

9. Define Random failure.

10. What is Replacement?

SECTION B — (5 × 5 = 25 marks)

Answer ALL the questions.

11. (a) The Manager of a flower shop promises its customer delivery within 4 hours on all flowers are purchased on the previous day and delivered to parker by 8.00 am the next morning. The daily demand for roses in as follows.

Dozens of Roses :	70	80	90	100
Probability :	0.1	0.2	0.4	0.3

The Manager purchases Roses for Rs.10 per dozens and sells for Rs.30. All unsold Roses are donated to a local hospital. How many dozens of Roses should Parker order each evening to maximize profit? What is the optimum expected profit?

Or

(b) A physician purchases a particular vaccine on Monday each week. The vaccine must be used within the following week, otherwise it becomes worthless. The vaccine costs Rs.2 per dose and the physician charges Rs.4 per dose. In the past 50 weeks, the physician has administered the vaccine in the following quantities:

Doses per week :	20	25	40	60
No.of week :	5	15	25	5

Determine how many doses the physician should buy every week.

18. The following tables gives data on normal time and cost and crash time for a project,

Activity	Normal		Crash	
	Time (weeks)	Cost (Rs.)	Time (weeks)	Cost (Rs.)
1-2	3	300	2	400
2-3	3	30	3	30
2-4	7	420	5	580
2-5	9	720	7	810
3-5	5	250	4	300
4-5	0	0	0	0
5-6	6	320	4	410
6-7	4	400	3	470
6-8	13	780	10	900
7-8	10	1000	9	1,200

Indirect cost is Rs. 50 per week.

(a) Find out the total float associated for each activity.

(b) Crash the relevant activities systematically and determine the optimal project completion time and cost.

If the product is not sold in export market, it can always be sold in domestic market, there are no other implications like interest and time.

(a) Draw the decision tree

(b) Should the businessmen go for selling the product in the export market? Justify.

17. (a) At present a company purchase an item from, outside supplies. The consumption of this item is 10,000 units year. The cost of the items Rs. 5 per units are the ordering cost is estimated to be Rs. 100 per order the cost of carrying inventory is 25 percent. If the consumption rate is uniform, determine the economic purchasing quantity.

(b) In the above problem assume that company is going to manufacture the item with the equipment that is estimated to produce 100 units per day. The cost of the unit these produced is Rs. 3.50 per unit. The set up cost is Rs. 150 per set up inventory carrying charge in 25 percent. How is your answer changed?

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12. (a) Listed in the table are the activities and sequencing necessary for a maintainance job on the heat exchanges in a refinery.

Activity :	A	B	C	D	E	F	G	H	I	J
Predeccessor :	–	A	B	B	B	C	e	F,G	D,E,H	I

Draw a network diagram of activities for pre project.

Or

(b) Following are the manpower requirement for each activity in a project.

Activity :	1-2	1-3	2-4	2-6	3-4	4-5	4-6	5-7	6-7	7-8
Normal time : (Days)	10	11	13	14	10	7	17	13	9	1
Man power : (per day)	2	3	4	3	1	3	3	5	8	11

Draw the network and find total float and free float for each activity.

13. (a) The production deportment of a company requires 3600 kg of raw material for manufacturing a particular item per year. It has seen estimate that the cost of placing an order is Rs. 36 and the cost of carrying inventory is 25 percent of the investment in the inventories. The price is Rs. 10 per kg. Determine the ordering policy. If raw material.

Or

(b) An aircraft company uses rivets at a constant. Rate of 2500 per year. Each units costs Rs. 30. The company personnel estimates that it costs Rs. 130 to place an order and the carrying cost of inventory is 10 per unit per year. Determine Optimum size and time.

14. (a) Explain in brief, the main characteristics of the queuing system.

Or

(b) A single server queuing system with poison input expontial service times. The mean arrival rate is 3 calling units per hour the expected service time is 0.25 hour and the maximum permissible calling units in the system is two. Determine the steady – state probability distribution of the number of calling units in the system and calculate the expected No.of systems.

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15. (a) An engineering company is offered a mercurial handling equipment A. It is price of Rs. 60,000 including cost of installation. The cost for operation and maintance are estimate 10 sec Rs. 10,000 for each of the first five years, increasing every year by Rs. 3,000 in the 6th and subsequent years. The company expects a return of 10 percent on all its investment what is the optimal replacement period.

Or

(b) A firm consisting the replacement of a Machine, whose cost price Rs. 21,200 and its scrap value is Rs. 20 running cost are found to be as follows:

Year :	1	2	3	4	5	6	7	8
Running : (cost)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. A business man has an option of selling a product in domestic market or in export market. The relevant dates are

Items	Export Market	Domestic Market
Probability of selling	0.6	1.0
Probability of keeping delivery schedule	0.8	0.7
Penalty of not meeting delivery schedule (Rs.)	50,000	10,000
Selling price (Rs.)	9,00,000	8,00,000
Cost of 3rd party inspection (Rs.)	30,000	Nil
Probability of collection of sale amount	0.9	0.9